

RETHINKING EXTINCTION

Toward a less gloomy environmentalism

By James K. Boyce

A little more than a hundred years ago, a bird named Martha, the last surviving passenger pigeon, died in the Cincinnati Zoo. Her death was remarkable in the annals of extinction not only because we know its precise date—September 1, 1914—but also because only decades earlier the passenger pigeon had been the most abundant bird on earth. Martha's demise helped to transform American beliefs about our relationship with nature, and the bird became an icon in the environmental movement, which was emerging just as she died.

Among the many billions of passenger pigeons who predeceased Martha was her cage mate, George, who died in 1910. The pair were named after Martha and George Washington. In the century that separated the first First Lady from the last passenger pigeon, the American economy went through a profound transformation. The country's population increased more than tenfold, and average income more than quadrupled. Only 6 percent of Americans lived in cities when Martha Washington died, in 1802. In 1914, the number was closer to 50 percent. The passenger pigeon's extinction was bound up with these changes,

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and what happened to the bird tells us much about what happened—and is still happening—to us.

Tourists came from near and far to see Martha after George's death. The



aerial displays of passenger pigeons had astonished their parents and grandparents, but at the zoo they found a pathetic creature with “drooping wings, atremble with the palsy of extreme old age,” in the words of a reporter. To dissuade the public from flinging sand at her to make her move, the zookeepers roped off her cage.

After her death, Martha was frozen in a 300-pound block of ice and shipped to the Smithsonian Institution, in Washington. Her internal organs were removed and preserved in the museum's “wet collections,” and her skin was stuffed and mounted for display. In 1977, when the Cincinnati Zoo opened a passenger-pigeon memorial, Martha was flown in for the dedication ceremony. She traveled first class.

The species at greatest risk for extinction tend to be small, geographically isolated populations: of the 140 documented bird extinctions since the sixteenth century, 133 were species found only on islands. The passenger pigeon was different. Unlike, say, the black mamo, which was endemic to the island of Molokai in the Hawaiian archipelago and went extinct around the same time, the pigeon had a range that covered most of the United States and Canada east of the Rockies, north of the Gulf of Mexico, and south of Hudson Bay. And its sheer numbers were almost beyond belief.

The ornithologist Alexander Wilson, writing at the dawn of the nineteenth century, described a flock crossing the Ohio River:

A column, eight or ten miles in length, would appear from Kentucky ... steering across to Indiana. The leaders of this great body would



sometimes gradually vary their course, until it formed a large bend, of more than a mile in diameter, those behind tracing the exact route of their predecessors. This would continue sometimes long after both extremities were beyond the reach of sight, so that the whole, with its glittery undulations, marked a space on the face of the heavens resembling the windings of a vast and majestic river.

Wilson estimated the number of pigeons in the flock using its density, breadth, speed, and the time it took to pass overhead, and came up with a count of 2,230,272,000. In *Birds and People* (2013), Mark Cocker, a British naturalist, concludes that while this was probably an overestimate, Wilson had undoubtedly seen “well over a billion birds.” And that

was just one flock; at any given time several were likely to have existed on the continent, plus a scattering of smaller groups and individuals.

A. W. Schorger, whose 1955 monograph on the passenger pigeon is the most exhaustive—some might say obsessive—assemblage of information about the species, reckoned that its total population when Europeans first



reached America was 3 to 5 billion. To put this number in perspective, the current worldwide population of rock doves—what most people recognize as pigeons—is around 260 million.

The passenger pigeon is held in tender regard by environmentalists today, but it is worth pausing to imagine the birds in their heyday. The majestic rivers in the sky could

inspire not only awe but also dread. When a flock appeared in Columbus, Ohio, in the spring of 1855, and blotted out the sun, “Children screamed and ran for home,” according to an account published years later in the *Columbus Dispatch*. “Women gathered their long skirts and hurried for the shelter of stores. Horses bolted. A few people mumbled frightened

words about the approach of the millennium, and several dropped on their knees and prayed.”

The birds roosted and nested in enormous colonies. The largest on record, found in central Wisconsin in 1871, extended for 850 square miles. As many as 300 birds would alight in a single tree, shattering trunks and branches with an effect that was

likened to that of a tornado or hurricane. The clearings the pigeons created were soon populated by species that did not thrive in dense forest. The fuel buildup from broken limbs increased the intensity of fires. Pigeon excrement altered the nutrient balance of the soil. The birds' heavy consumption of red-oak acorns is believed to have tilted the composition of eastern forests in favor of white oaks. In these respects, the passenger pigeon was a

lost species: the mastodon and the mammoth. By 1812, when he published a landmark four-volume treatise on fossil animals, he and others had identified forty-nine vanished species, including a cave bear, a pygmy hippopotamus, and a pterodactyl.

Cuvier's discovery touched off a revolution in our understanding of nature that is still, in some ways, incomplete. In the years that followed his treatise, debate raged over the

As Elizabeth Kolbert recounts in *The Sixth Extinction* (2014), Cuvier's discovery of extinction opened the door to Darwin's discovery of evolution. If old species could disappear, maybe new species could emerge. Darwin's theory of natural selection put the two processes together. In Kolbert's words, "Extinction and evolution were to each other the warp and weft of life's fabric." But Darwin, like Lyell, believed that the process of extinction



keystone species, which helped shape the ecosystems of eastern North America.

We now know that 99.9 percent of all species that ever existed are extinct. But until the end of the eighteenth century, the idea that *any* species had gone extinct was almost unknown. Nature was seen as a steady state, an unchanging tableau, not a process. Thomas Jefferson, whose passions included natural history, put it this way:

Such is the economy of nature that no instance can be produced of her having permitted any one race of her animals to become extinct; of her having formed any link in her great work so weak as to be broken.

The discovery of extinction is generally credited to Georges Cuvier, who taught at the Museum of Natural History in Paris and, in his spare time, studied the ancient bones in its collection. In 1796, Cuvier delivered a public lecture in which he announced that he had identified two

causes of extinction. Cuvier believed that extinctions were the result of planetary catastrophes, a view compatible with the Bible's great deluge. Within a few decades, however, an alternative view propounded by the Scottish geologist Charles Lyell had won the day. Lyell argued that extinction happened gradually, over millennia, not in cataclysmic spasms. It would not be until 1980, when a study connected the extinction of the dinosaurs to the impact of an asteroid, that the possibility of abrupt mass extinction was again taken seriously.

Scientists now recognize that both mass and gradual extinctions have occurred. Mass extinctions get more press: five of them are known to have happened so far, and some say we are now embarking on a sixth, with humans playing the part of the asteroid. Yet scientists have calculated that the Big Five together account for only 4 percent of the extinctions that have taken place over the past 600 million years. The rest occurred in the absence of a global cataclysm.

was so gradual as to be practically imperceptible. The idea that a mass extinction could happen in our own time, and that we could cause it, required a mental leap that even Darwin wouldn't take.

The birds that most of us eat today are chickens—lots of them—and turkeys, with the occasional duck, quail, or pheasant thrown in. So it is something of a shock to remember that, not so long ago, Americans were happy to eat just about anything with wings. An 1867 inventory of fowl available in the game markets of New York City and Boston featured not only wild turkeys, partridges, and grouse but also robins, great blue herons, sandpipers, meadowlarks, blue jays, and snow buntings.

In season, passenger pigeons were especially plentiful. Alexander Wilson reported they were sometimes eaten for breakfast, lunch, and dinner. The pigeon potpie—sometimes garnished with pigeon feet stuck in the middle—was common fare in colonial America. Passenger pigeons

Left: A group of pigeons, including several passenger pigeons, that lived in captivity in the aviary of C. O. Whitman, professor of zoology at the University of Chicago, 1896. Photograph by J. G. Hubbard. Courtesy Wisconsin Historical Society. Right: *Passenger Pigeon Net*, by James Pattison Cockburn. Courtesy Library and Archives Canada

were preserved for out-of-season consumption by being salted, pickled in apple cider, smoked to make jerky, or sealed in casks with molten fat.

According to Schorger, the birds were “a boon to the poor”: in 1754, a half dozen sold in New York for a penny, a sum equivalent to thirty cents today. In times of surplus, they were fed to hogs.

By the middle of the nineteenth century, railroads had connected the cities of the eastern seaboard to the great nesting colonies of the Midwest. Word of the flocks’ locations spread rapidly thanks to another new technology, the telegraph, which allowed professional market hunters, as well as local amateurs, to converge on a site.

The most common way to kill passenger pigeons was to shoot them. Because the birds clustered so densely, no great skill was required to blast them from trees or out of the sky with a shotgun. Nets were widely used as well. Trappers broadcast grain and deployed captive “stool pigeons” to attract the birds, enabling them to snare hundreds at once. Captured pigeons could be killed by crushing their skulls between the thumb and forefinger, though, as Schorger notes, “It was difficult to continue this method without fatigue when many birds were handled.” Some hunters used specially designed pliers to break the birds’ necks. Others used their teeth, as Joel Greenberg recounts in *A Feathered River Across the Sky* (2014). Here’s how he describes Old Joe, a one-armed Civil War veteran who netted pigeons near Petoskey, Michigan, in 1878:

With one motion, he would grab a pigeon by the leg and toss it into his mouth head first, then chomp down on the skull: “What a sight! His face was smeared with blood from ear to ear; his beard dripped gore; and his clothes were covered with it.”

Dead pigeons were packed in ice, about 400 to a barrel, for shipment by rail to urban markets. A million and a half were sent south and east from the Petoskey nesting, which caused the price per barrel to fall below the cost of shipping them. For every bird that made it to the dinner table, many more were wasted. Vast numbers were left where they fell for the hogs to

clean up; others spoiled in transit. As many as 10 million pigeons may have died at the Petoskey nesting altogether.

Scientists now recognize that, in addition to island species, another type of animal is especially vulnerable to extinction: those with dense colonies that attract intensive human exploitation for the market.

Not everyone was oblivious to the risk of the passenger pigeon’s extinction. After witnessing the slaughter at a Kentucky roost in 1847, the French traveler Bénédict-Henry Révoil predicted that the passenger pigeon would “simply end by disappearing from this continent” within a century. As Greenberg remarks, Révoil turned out to be “overly optimistic by about fifty years.”

To most Americans, however, the passenger pigeon seemed ridiculously abundant, and the suggestion that it could disappear was preposterous. An 1857 Ohio State Senate committee report summed up the prevailing sentiment:

The passenger pigeon needs no protection. Wonderfully prolific, having the vast forests of the North as its breeding grounds, traveling hundreds of miles in search of food, it is here today, and elsewhere tomorrow, and no ordinary destruction can lessen them or be missed from the myriads that are yearly produced.

(The Ohio Historical Society ranked this as the fifth most embarrassing moment in the state’s history; the top spot went to the Cuyahoga River, in Cleveland, bursting into flames in 1969.)

When the passenger pigeon disappeared from North America’s skies, many could not believe it was really extinct and claimed that the birds had migrated to South America or Australia. Others accepted that the birds were gone but suggested that they had succumbed to some mysterious disease. Henry Ford thought they had drowned in the Pacific while attempting to fly to Asia.

In the end, it was the passenger pigeon’s very abundance that probably sealed its fate. Roosting and nesting in close proximity and in vast colonies, the species exhibited the ecological survival strategy known as “predator satiation”: their numbers were suffi-

cient to weather any losses to weasels, raccoons, hawks, and other predators. Since the pigeons moved frequently, predator populations in any one place could never grow to the point that they posed an existential threat.

But in the hunters of the nineteenth century, the passenger pigeon encountered a predator that could not be satiated. The last passenger pigeon killed in the wild is generally believed to have been shot by a boy in Pike County, Ohio, on March 24, 1900. The bird was stuffed by the wife of a retired sheriff (some say the sheriff shot it himself and invented the boy as a cover story) and was named Buttons for the black shoe buttons she used to cover the holes where the eyes had been. Today Buttons is displayed at the Ohio History Center, in Columbus. Greenberg uncovered evidence of a later specimen shot in Indiana in 1902 that was destroyed when rain breached the roof of the woodshed attic where it was stored.

The extinction sparked a range of emotions. Rewards were offered for the discovery of survivors. “No better example of eternal hope, so characteristic of man, can be found,” Schorger writes, “than the search for a living wild passenger pigeon long after it had ceased to exist.” Federal and state wildlife-protection laws were passed, too late for the passenger pigeon but in time to save animals such as the American bison, another once-plentiful species that had been pushed to the verge of extinction.

On a psychological level, people struggled with the knowledge that extinction could happen so quickly, and that we could be the cause. It suggested a profoundly disquieting thought: if an apparently successful species like the passenger pigeon could go extinct, couldn’t the same thing happen to us?

In 1947, the Wisconsin Society for Ornithology erected a monument to the passenger pigeon in Wyalusing State Park, near the site of the great nesting of 1871, with this inscription: THIS SPECIES BECAME EXTINCT THROUGH THE AVARICE AND THOUGHTLESSNESS OF MAN. Like most epitaphs, it’s a teaser. It hints at what happened but leaves a lot unsaid. What was the relation between “avarice” and “thoughtlessness”—did

avarice overwhelm thought, or did thoughtlessness leave the door open to avarice? What thought or thoughts, exactly, were missing? And did the blame lie with “man” or with particular men?

A recurrent theme in the narratives of American environmentalism is that people are bad. Humans, in this telling, are sinners, a cancerous growth on the face of the planet. The traditional goal of the environmental movement has been to restore a baseline, a state of nature that existed before human defilement. But however well these people-versus-nature narratives served environmentalism over the past century, the time has come to dismantle them and erect a new intellectual scaffolding.

Just as the passenger pigeon’s demise helped to shape twentieth-century environmentalism, so might a new and unlikely effort to resurrect the species change environmental thought and practice in the coming century. In February 2012, an invitation-only meeting was hosted at Harvard Medical School by George Church, a pioneer of genetic sequencing and the leader of the synthetic-biology team at Harvard’s Wyss Institute for Biologically Inspired Engineering. It was convened by Stewart Brand, who heads the Long Now Foundation in San Francisco, and his wife, Ryan Phelan, the founder and former CEO of a genetic-testing company called DNA Direct. The meeting’s purpose was to consider using recent advances in genetic engineering to bring back the passenger pigeon.

The idea originally came from Brand, who was the founding editor of the *Whole Earth Catalog*. In an email to Church and the Harvard biologist Edward O. Wilson, he wrote, “The death of the last passenger pigeon in 1914 was an event that broke the public’s heart and persuaded everyone that extinction is the core of humanity’s relation with nature.” He asked Church, who had already raised the possibility of bringing back the woolly mammoth, whether it would be possible to recreate the passenger pigeon. Brand seemed motivated less by the passenger pigeon’s importance to the environment than by its importance to environmental ideology. “The environmental and conservation movements have mired themselves in a tragic view of life,” he explained. “The return of

the passenger pigeon could shake them out of it—and invite them to embrace prudent biotechnology as a Green tool instead of a menace in this century.”

According to *The New York Times Magazine*, Church wrote back within three hours with “a detailed plan to return ‘a flock of millions to billions’ of passenger pigeons to the planet.” The plan proposed extracting DNA fragments from museum specimens of passenger-pigeon remains and combining these with DNA from the bird’s closest living relative, the band-tailed pigeon. Germ cells with the new genome would be inserted into the eggs of band-tailed pigeons, and the resulting chicks should produce offspring that carry traits from both species. The progeny would then be crossed through several generations to breed a new species that, while not identical to the original, would come pretty close. Brand and Phelan founded an outfit called Revive and Restore, with Phelan as its executive director, to translate the concept into reality.

Not everyone is convinced that this is a great idea. David Blockstein, a passenger-pigeon expert and senior scientist at the National Council for Science and the Environment, who participated in the Harvard meeting, is among the skeptics. “Suppose you did create a pseudo-passenger pigeon. Then what?” he asks. “This was a bird that needed hundreds of thousands of other birds to survive. How do you get there?” Blockstein also worries that efforts to revive extinct species could divert scarce resources from efforts to save endangered species that still exist, and that our commitment to saving them could be undermined if we come to believe that extinction is something we can reverse whenever we want. (It’s also much cheaper to keep a species alive than it is to resurrect it.)

Others have been more receptive. In March 2013 the National Geographic Society hosted a TEDx conference on “de-extinction” at its Washington headquarters that was convened by Revive and Restore. It featured discussions about efforts to bring back the passenger pigeon, the woolly mammoth, the Tasmanian tiger, and other species. Two months later, *Audubon* magazine carried a short interview with Ben Novak, a researcher at Revive and Restore,

under the cheery headline WELCOME BACK. The public appears to like the idea of de-extinction, or at least to accept it as possible and hence probably inevitable, influenced perhaps by *Jurassic Park*. The *Times Magazine*, citing a Pew poll from 2010, noted that “belief in de-extinction trails belief in evolution by only 10 percentage points.”

Restoring the passenger pigeon, or a facsimile of it, could mark a turning point in the attitudes of environmentalists toward new biotechnologies, in part by challenging the people-are-bad narrative. But de-extinction perpetuates another dubious tenet of environmental ideology, one that coalesced a century ago: the idea that it’s always preferable to return to a bygone baseline. For better or worse, ecosystems change. A big question—the mammoth in the room—is what’s better and what’s worse. It’s not obvious that turning back the clock is necessarily a good idea when the clock has kept ticking.

In thinking about what we should and should not do to create better ecosystems, history suggests that a certain degree of humility is in order. In 1872, a Cincinnati businessman named Andrew Erkenbrecher founded the Society for the Acclimatization of Birds, with the aim of importing nonnative bird species from Europe to combat a local caterpillar infestation. (The next year he founded the Cincinnati Zoo, where Martha died.) Among the species Erkenbrecher introduced to Cincinnati was the common starling. Although his first introductions did not survive, subsequent starling releases successfully established the species that Edward O. Wilson has called “a plague across America.” The worldwide starling population today is estimated at 600 million, about one third of which are in the Western Hemisphere. If we bring back passenger pigeons in even greater numbers, it’s not evident that this will be counted as a blessing a century from now.

Rather than pursue the hope that we can reverse time and retrieve a happy ending, perhaps we need to learn to admit it when we make terrible mistakes, absorb their lessons, and move on.

In the summer of 2007, the National Audubon Society issued a report called “Common Birds in



Photographs by Keith Carter. In May, Carter traveled to the Galápagos Islands to document the ways that humans have affected the ecosystems of the archipelago. This page: Tree ferns, Santa Cruz Island (top) and sea lion, Isabela Island (bottom)



Decline.” Analyzing four decades of population data, it warned of an “alarming decline of many of our most common and beloved birds.”

The story received wide press coverage. “We somehow trusted that all the innocent little birds were here to stay,” an editorial in the *New York Times* lamented. “What they actually need to survive, it turns out, is a landscape that is less intensely human.”

Few reporters or commentators bothered to examine the raw data on which the Audubon report was based. Had they done so, they would have found that among 309 bird species for which statistically meaningful trends could be established, species that experienced large population increases outnumbered, by an impressive margin, those showing large decreases. They might also have noticed that some of the birds in greatest decline are species that live in meadows, pastures, and early successional forests, habitats that have dwindled over the past 150 years as forests, especially in the northeastern states, reclaimed abandoned farmland. It turns out that birds like bobwhites, meadowlarks, and field sparrows would benefit from having a landscape that is a little *more* intensely human.

When I visited Robert Askins, a Connecticut College ornithologist and the author of *Restoring North America's Birds* (2000), he recalled the condition of bird populations at the close of the nineteenth century. The picture he painted was bleak. “After the passenger pigeon, the market hunters didn’t go into some other line of work,” he said. “They just moved on to other species. Back in 1900 you would have seen few waterbirds around here. No egrets. No sandpipers. Any ducks that survived would have been so gun-shy that you wouldn’t know they were there.”

Much has changed since then, and from the standpoint of wild

birds it's not all bad. The Migratory Bird Treaty Act of 1918 banned the hunting and sale of most bird species. Thanks to the growth of the domesticated poultry industry, Americans eat more bird meat but a lot less wild fowl. In the middle of the century, when a new threat to birds emerged from DDT and similar pesticides, Rachel Carson's *Silent Spring* helped to inspire a ban on their use. Concerted and even heroic efforts were undertaken to restore populations of threatened species like the bald eagle and the wild turkey.

This does not mean that everything is hunky-dory. Climate change now threatens birds and all other living things. Birds may initially fare better than other species by virtue of their mobility. (In New England, where I live, southern species like the cardinal, the tufted titmouse, and the Carolina wren have become common residents.) But the ecosystems on which they rely for food cannot move as quickly. The environmental challenges we face today differ from those we faced a century ago. Our narratives must change, too. New technologies—notably, energy technologies—will be a necessary part of any solution. The quest to preserve or restore a baseline state of nature, always a mirage, is slowly being abandoned; ecologists have begun to think in terms of maintaining valuable processes rather than trying to freeze the biological landscape.

Humans are part of the web of life, and we can and sometimes do have positive impacts on the rest of nature. The old people-are-bad, nature-is-good formula, which was so central to the environmentalism that was born when Martha died, is too glib, and too often counterproductive. For when the choice before us is framed as humans versus nature, it turns out that most people, with however much regret, will choose humans. ■



Small-billed ground finch, Baltra Island
Tour group, Santa Cruz Island